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TITLE: Method for dual damascene process using electron beam and ion implantation cure methods for low dielectric constant materials

Brief Summary Text (17):

In accordance with still another aspect of the present invention, the topmost layer of the low dielectric constant material that has been cured by either an electron beam or ion implantation to form a hard mask can be used as a CMP stop during metal CMP. This is a distinct advantage over curing of low dielectric constant materials by the conventional method of thermal treatment only. The present invention's use of the hard mask created by the application of an electron beam or ion implantation for CMP stop during metal CMP improves process robustness and process window.

Detailed Description Text (17):

Metal CMP typically takes place after filling the via and trench with a metal. As previously stated, exposure of a low dielectric constant material to an electron beam or ion implantation involves both electron beam irradiation or ion implantation, in addition to rapid thermal heating, both of which occur simultaneously. Further, it should be pointed out that the bottom surface of the wafer substrate may be heated with a quartz lamp during curing with either an electron beam or ion implantation, in accordance with the present invention, to form the etch stop in the layers comprising a low dielectric constant material. In contrast, the conventional method for curing a low dielectric constant film in dual damascene processing involves thermal treatment only. Use of thermal treatment only in curing the low dielectric constant film does not create the hard mask or etch stop that is created by curing the low dielectric constant film with either an electron beam or ion implantation. Accordingly, those skilled in the art will appreciate that the dual damascene process of the present invention, which includes curing of the low dielectric constant material with an electron beam or ion implantation, will enable the hard mask or etch stop created in the uppermost layer of the low dielectric constant material to serve as a CMP stop during metal CMP after filling the via and trench with metal.

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